

SUPER TYPHOON LYNN (20W)

Super Typhoon Lynn was the third tropical cyclone of 1987 to produce maximum sustained surface winds of 140 kt (72 m/sec) with gusts to 170 kt (87 m/sec) and the second to attain an estimated minimum sea-level pressure (MSLP) of 898 mb (only Super Typhoons Betty (09W) and Nina (22W) were lower with a MSLP of 891 mb). It was also the fifth super typhoon of the year. Lynn, during its latter stages, also had a devastating impact on Taiwan and caused some concern in the Hong Kong area, as well.

Lynn began as a broad, poorly organized area of convection in the monsoon trough about 200 nm (370 km) north-northeast of Kwajalein Atoll in the Marshall Islands. After the convection had persisted for 24-hours, it was added as a new suspect area to the Significant Tropical Weather Advisory (ABPW

PGTW) at 150600Z. Maximum sustained surface winds were estimated at 15 to 20 kt (8 to 10 m/sec); the MSLP was estimated to be 1008 mb. Over the next 18-hours, upper-level outflow and the amount of convection increased significantly as the MSLP decreased to 1001 mb. For these reasons, a Tropical Cyclone Formation Alert was issued at 160030Z, when the system was located about 360 nm (667 km) north-northwest of the island of Pohnpei in the eastern Caroline Islands. Six hours later at 160600Z, the first warning on Tropical Storm Lynn (20W) was issued, based on the satellite intensity estimate (Dvorak, 1984) of 35 kt (18 m/sec). Until 171800Z, Lynn had been moving toward the west along the southern periphery of the subtropical ridge. Before reaching tropical storm intensity, Lynn had been moving at speeds in excess of 20 kt (37 km/hr). But as it began to intensify, it decelerated. By 161200Z,

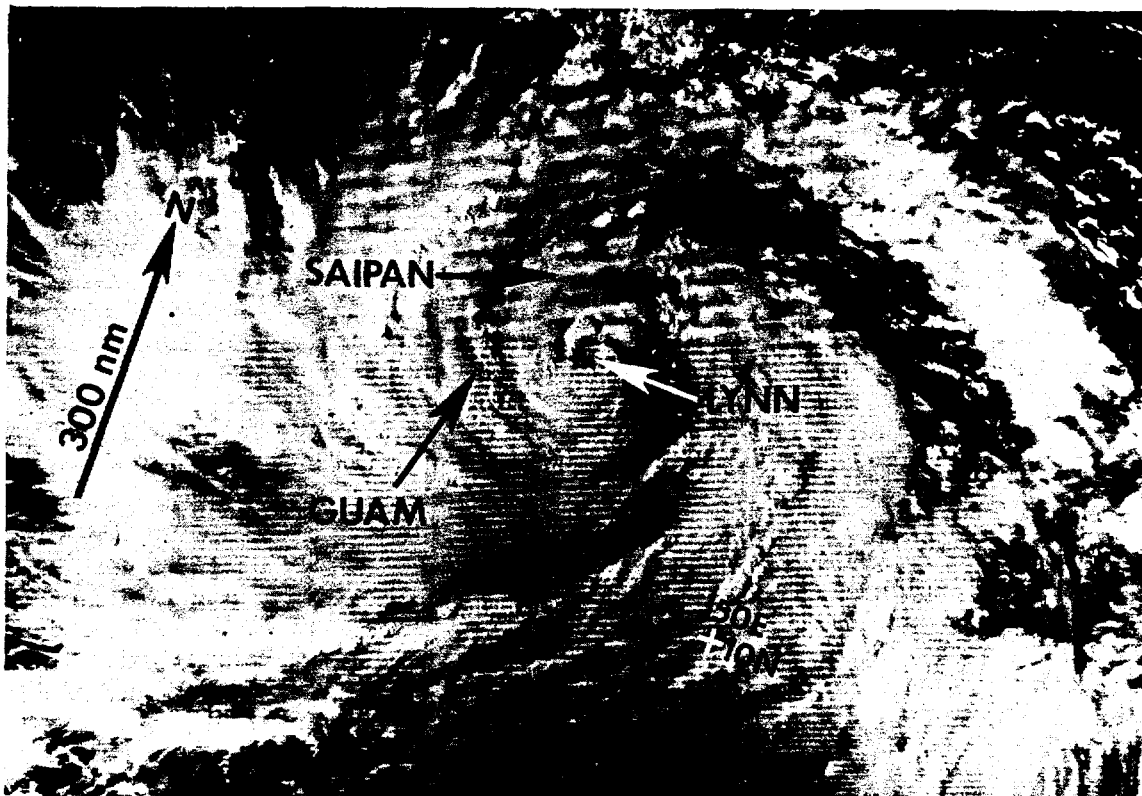


Figure 3-20-1. Tropical Storm Lynn (20W), shortly before being upgraded to typhoon intensity (180528Z October NOAA visual imagery).

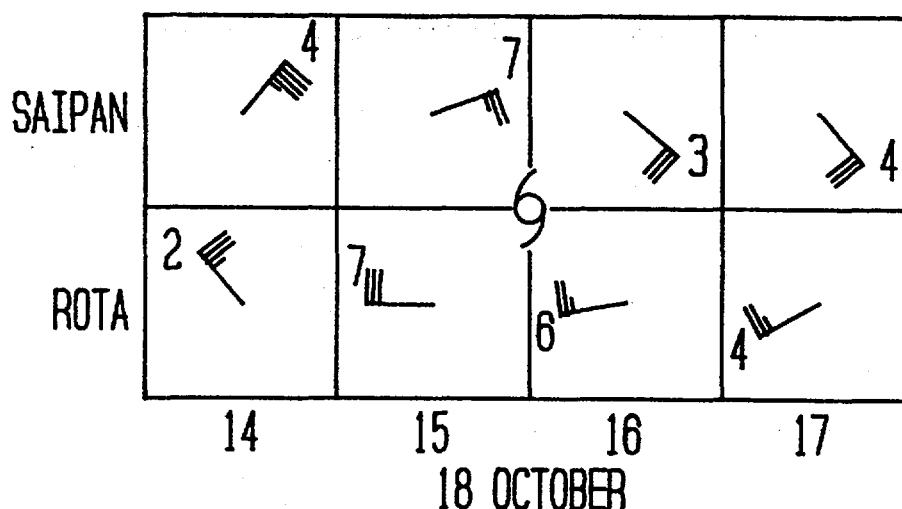


Figure 3-20-2. HAN/DAR observations for the islands of Saipan and Rota. These observations illustrate the closest point of approach of Typhoon Lynn to Saipan and Rota was between 181500Z and 181600Z.

Lynn was moving at a speed of only 6 kt (11 km/hr). At 180600Z, it was upgraded to typhoon status when visual and infrared satellite imagery, plus radar observations from Andersen Air Force Base on Guam, indicated Lynn had formed an eye 20 nm (37 km) in diameter (see Figure 3-20-1). Satellite analysis at that time estimated Lynn's intensity at 65 kt (33 m/sec). (Post-analysis on the system indicated that Lynn was most probably a typhoon at 180000Z.)

As it intensified, Typhoon Lynn was starting to track toward the west-northwest, away from Guam towards the island of Saipan. Consequently, JTWC amended its 180600Z warning which had forecast a more westward track. At 181200Z, Typhoon Lynn made its closest point of approach (CPA) to Guam when it tracked 75 nm (139 km) to the northeast of the island. Maximum sustained surface winds recorded on the island were 36 kt (19 m/sec) with a peak gust of 57 kt (29 m/sec) at Agana (WMO 91212). A maximum rainfall accumulation of 6.08 inches (154.4 mm) was recorded at Andersen Air Force Base (WMO 91218).

Lynn's approach had a profound effect on the island of Guam. Apra Harbor on the west side of Guam was closed after four U.S.

Navy ships sortied to open waters. Military airfields evacuated aircraft and secured some aircraft in hangars. All commercial flights to and from Guam were cancelled on 18 October. Most villages on Guam reported flooding in low-lying areas, broken windows, and power and water outages. The power outages were caused mainly by the high winds which knocked vegetation onto power lines, and required several days for Guam Power Authority to repair. Perhaps the most serious damage from Typhoon Lynn was to local agriculture.

At 181500Z, Lynn made its CPA to the island of Tinian - 15 nm (28 km) southwest of the island. The automatic weather station observations at Rota, 53 nm (98 km) south-southwest of Tinian, and at Saipan, 5 nm (9 km) to the northeast of Tinian, for 181500Z and 181600Z recorded Lynn's passage (see Figure 3-20-2). Maximum sustained surface winds of 45 kt (23 m/sec), with a peak gust of 65 kt (33 m/sec) were recorded on Saipan. All commercial airline flights to and from Saipan were cancelled. Schools and government offices on Saipan were closed on 19 and 20 October. The islands of Saipan and Rota both experienced island-wide power outages on the evening of 18 October.

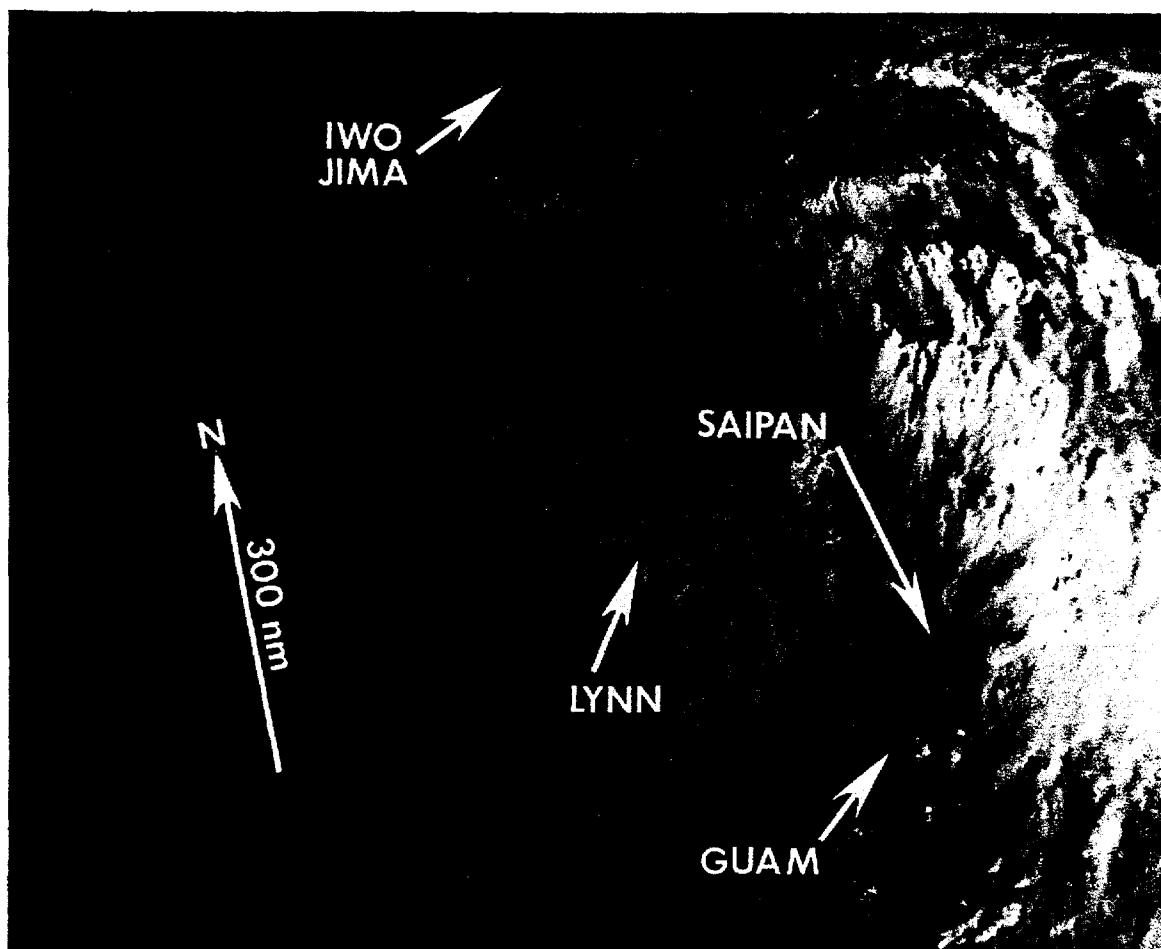


Figure 3-20-3. Super Typhoon Lynn at its maximum intensity of 140 kt (72 m/sec) (192240Z October NOAA visual imagery).

Once past the Marianas, Lynn intensified rapidly from 80 kt (41 m/sec) to its peak intensity of 140 kt (72 m/sec), reaching super typhoon intensity (130 kt or 67 m/sec) shortly after 191800Z. Super Typhoon Lynn maintained its 140 kt (72 m/sec) intensity (Figure 3-20-3) until 210000Z.

As Lynn began weakening after 210000Z, its track became westerly. Prior to that time, the forecast track had been west-northwesterly to northwesterly. Numerical guidance provided by the One-Way Interactive Tropical Cyclone Model (OTCM) appeared to be accurate. The 210600Z warning echoed this guidance, however Lynn persisted on its westward track. A closer look at the lower-tropospheric and deep-layer mean flow fields

north of the typhoon provided a clue as to why Lynn was not behaving as expected. Because of Lynn's synoptic size cyclonic circulation, the integrated effect on the low- and mid-level steering flow was to eliminate the narrow subtropical ridge. Perhaps, OTCM interpreted the large-scale storm-induced circulation as being the synoptic steering flow and therefore, did not detect the narrow subtropical ridge. In contrast, Lynn was large enough to be resolved by the Navy Operational Global Atmospheric Prediction System (NOGAPS) and European Center for Medium-Range Weather Forecasting (ECMWF) numerical models, which in turn provided more accurate forecast guidance. The next warning (number 22 at 211200Z) put the forecast back "on track" and OTCM became the less-favored alternate scenario.

A close encounter by a merchant vessel on 22 October provided testimony to the fury of the typhoon. Excerpts from the ship's log include:

"Sea and swell were of height and steepness that we couldn't turn around anymore ... Seas are approximately 2 1/2 times the bridge height and breaking all around us. At 1000 we recorded the lowest barometric pressure of 969 HPA", (approximately 75 nm (139 km) from the center of Typhoon Lynn, at that time). "During passage of "Lynn" visibility was reduced to 000.0 mtr. Wind above comprehension ... our ears on the bridge were popping due to pressure change with pitching of vessel."

At 240000Z, Lynn was tracking through the Luzon Strait, moving toward the northwest. From 24 through 26 October, it devastated portions of Taiwan (Figure 3-20-4). The island received high winds because of the strong pressure gradient between Lynn's low central pressure and the large high pressure area over mainland China. These high winds, caused rapid orographic lifting along the steep mountains of Taiwan, producing torrential precipitation. Although the center of Lynn passed 110 nm (204 km) to the southwest of Taiwan, it produced heavy weather over the northernmost parts of the island. News services reported 68 inches (173 cm) of rainfall on the capital city of Taipei from 24 to 26 October! In Taipei, torrential rainshowers caused landslides that smashed houses and killed 14 people. Over 2,200 people were stranded by floodwaters from

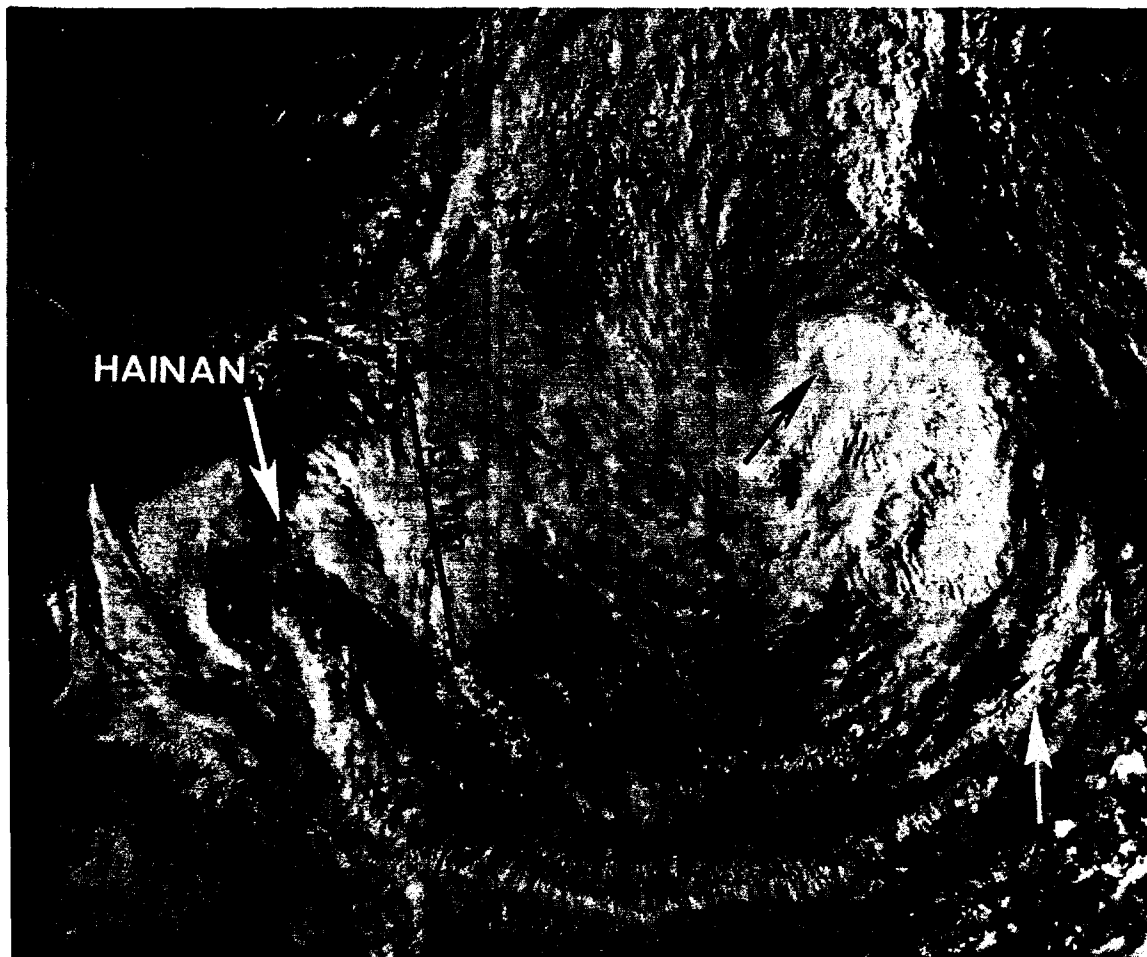


Figure 3-20-4. Tropical Storm Lynn during its rapid weakening phase (250013Z October NOAA visual imagery).

the Keelung River in Taipei making travel impossible. The Central Weather Bureau in Taipei reported 84 kt (43 m/sec) maximum sustained surface winds on 24 October and 61 kt (31 m/sec) maximum sustained surface winds on 25 October. The port city of Keelung reported over five million dollars worth of damage from Lynn. Lynn created 20 ft (6.1 meter) high waves at Hengchun on the extreme southern tip of Taiwan and nine children were swept away. The result of Lynn's passage was Taiwan's worst flooding in 40 years; 42 people perished and 18 were reported missing.

Visual and infrared satellite imagery at 260300Z, indicated that Lynn was being sheared apart. Subsequent satellite imagery showed the low-level circulation center moving

toward the west-southwest away from the convective mass. At 270000Z, the final warning was issued on Tropical Depression 20W (Lynn). Although the tropical cyclone had lost its central convection, the remaining low-level circulation center still had an impact on the Hong Kong area. The wind speeds and precipitation amounts the Hong Kong area received were higher than expected. The strong pressure gradient between the residual low offshore and the high over mainland China fostered gales along the south coast. The Hong Kong (WMO 45005) 280000Z upper-air sounding revealed maximum winds of 55 kt (28 m/sec) from the east-southeast, at 900 and 850 mb. The low tracked south of Hong Kong, into the Pearl River Estuary and eventually dissipated over land.